Q-MINDER QUEUE MANAGEMENT HOSPITAL'SPATIENTWITH SMS SYSTEM

Submitted as a Partial Fulfillment of the Requirements for Getting Bachelor Degree in Electrical Department Faculty of Enggineering

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Approverment letter

Q MINDER (Queue Management Hospital's Patient with SMS System)

Scientific publications

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D400 144 013

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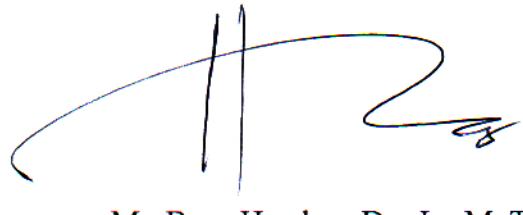

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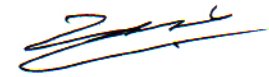

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Q-MINDER
QUEUE MANAGEMENT HOSPITAL'SPATIENTWITH SMS SYSTEM

Abstract

Q-Minder is a device that provides queue management in hospital. This device uses SMS (Short Message Service) to remind a turn of a patient in a queue in hospital. The development of this device is based on the sequencial numbers that is input of phone numbers on the device. To input a phone number, we use digital Keypad. After the phone number stored to the device, the user will get the information of queue number. The phone number will be stored into EEPROM (Electrically Erasable Programmable Read-Only Memory) of Arduino Mega 2560. As the brain, Arduino Mega 2560 also decide the queue number of the phone number. In the process, the operator of the device is able to send a SMS reminder of a next person's turn. To send an SMS to a phone number, we use GSM (Global System For Mobile) module that is attached to Arduino Mega 2560. Overall, we have three main processes in this device. First process is inputting phone number, second process is getting the queue number, and the third process is sending a reminder to phone number.

Keywords: *reminder, arduino, sms system, hospital*.

Abstrak

Q-Minder adalah perangkat yang menyediakan manajemen antrian di rumah sakit. Perangkat ini menggunakan SMS (Short Message Service) untuk mengingatkan pergantian pasien dalam antrian di rumah sakit. Pengembangan perangkat ini didasarkan pada nomor urut yang merupakan input dari nomor telepon pada perangkat. Untuk memasukkan nomor telepon, kami menggunakan Keypad digital. Setelah nomor telepon disimpan ke perangkat, pengguna akan mendapatkan informasi nomor antrean. Nomor telepon akan disimpan ke EEPROM (Memori yang Dapat Dihapus Secara Elektrik Dapat Dihapus) dari Arduino Mega 2560. Sebagai otak, Arduino Mega 2560 juga memutuskan nomor antrian dari nomor telepon. Dalam prosesnya, operator perangkat dapat mengirim pengingat SMS tentang giliran orang berikutnya. Untuk mengirim SMS ke nomor telepon, kami menggunakan modul GSM (Global System For Mobile) yang dilampirkan ke Arduino Mega 2560. Secara keseluruhan, kami memiliki tiga proses utama dalam perangkat ini. Proses pertama adalah memasukkan nomor telepon, proses kedua adalah mendapatkan nomor antrean, dan proses ketiga mengirimkan pengingat ke nomor telepon.

Keywords: *reminder, arduino, sms system, hospital*.

1. INTRODUCTION

In everyday life a thousand of people go to hospital.Sometimes it can be for their own sickness and sometimes to accompany someone who are close to them, but mostly there are problems that we all have to face and we are bothered from it, it is the

waiting line, sometime it takes an hour and sometime it takes much more longer than that if we are not lucky enough, maybe waiting for someone in my age is not really a big problem but the people who will face that problem is the old people and who bring their kids with their problem, and here comes our job as a technology guider to create a system that can give a solution for problem, create a system that can let you know through your phone number when your turn is already about to come, so the patient can go to have some rest or they may have to go to finish some other businesses and get it done in that time.

The system that we build in this project is a system that is based on SMS. The reason why we use the SMS technology is because SMS is a basic thing of our smartphone, and it is not required any internet to communicate to other. By this fact, using SMS is more likely to be a solution for this system. But also there is a limitation that further will be explained on this journal.

The usage of GSM (Global System for Mobile Communications) in this device is an advantage for theuser. The advantage of using this technology is that most of people are using this technology. Also the coverage, all GSM providers on whole world are expanding their coverage. In this case, the device that was made is fully maximize the usage of SMS service. Chen Peijang and Jiang Xuehua (2008) on their journal *"Design and Implementation of Remote Monitoring System Based on GSM"*, said that the usage of GSM module on a form of SMS that used as a long distance tracking system is effective and has some advantages and more user friendly.

2. RESEARCH METHODS

This project started in January 2018 as arequirement to finish undergraduate degree, and took place at Universitas Muhammadiyah Surakarta. In this final project preparation, observation and literatur study, designing the device, making the device, and experimental test are some steps that are conducted. Observation where theme thodisdone by way of direct descendance to obtain the necessary data, literature study which is a step to get refer encematerials from books, papers, papers, journals, or articles related to Arduino, GSM (Global System for Mobile) module, Keypad and som eother references that are able to support in finishing this Final Project. Making the tool that is implementing the results of Literature, Consultation, and Discussion to design and make a Q-Minder device. In the production of thisQ-Minder device, two

main of the design of hardware (Hardware) and software design (software) are provided.

The Q-Minder device was designed and constructed using the following materials:

-Arduino UNO - Arduino IDE - GSM Module - SIM800L - DC-DC converter - LCD 16x2 - Jumper Wires - Potentiometer - Keypad 3x4 - A Box - Smartphone

Before constructing the device, we make the whole idea that is visualized in Figure* 1 as the block diagram of the system. This block diagram, will show us how each component makesome interactions. As we mentioned earlier, Arduino Mega 2560 is the brain of the Q-Minder device. This Arduino will relate all the components as a unity. The arrow indicates the behavior of a component to another. For instance, LCD acts as output part because of the arrow is pointing to it. And same with the GSM module, it acts as output too. But, the Keypad is different, it acts as an input to arduino because the arrow is pointing from keypad to Arduino.

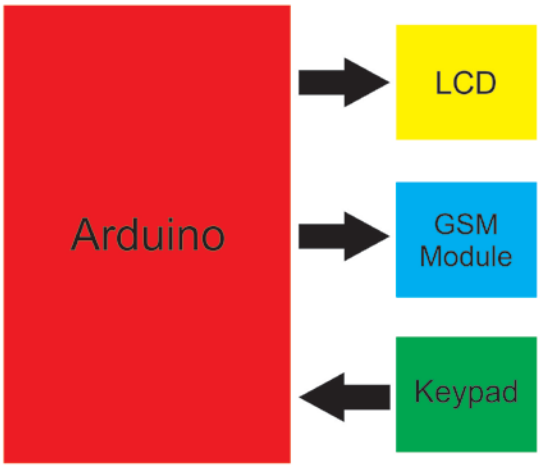

Figure 1. System Block Diagram

In the term of data, when keypad is being pressed, a digital input will be processed by arduino. Then the arduino will decide algorithmically to make some outputs to both LCD and GSM module. And in Figure 2, the algorithm of the Q-Minder system will be described in the form of a flowchart.

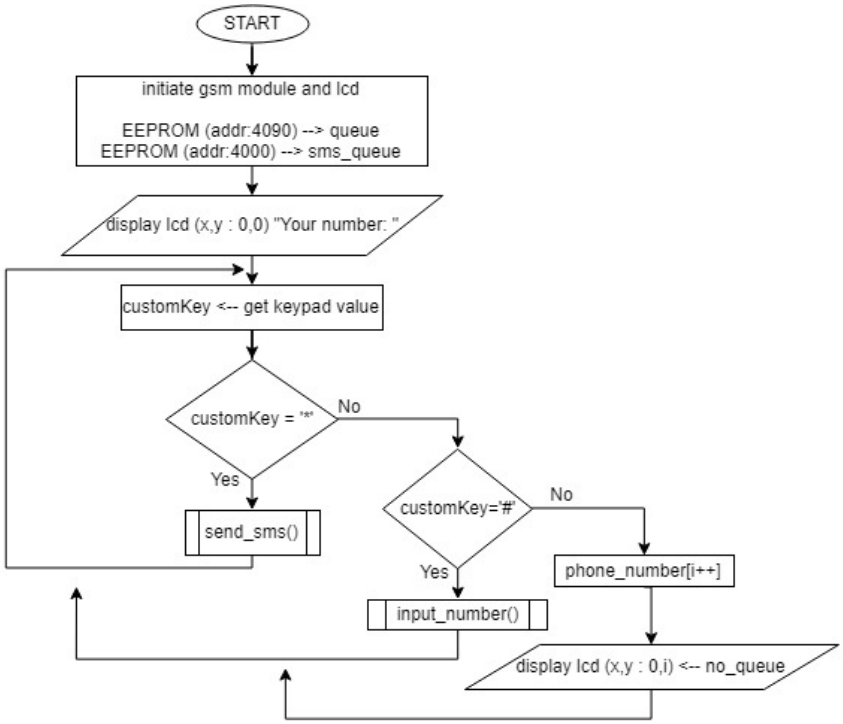

Figure 2. MainSystem Flowchart

Figure 2 above describes how the system flows. In this Main System Flowchart, we can clearly see that the work of the device, depends on the input from the keypad. Arduino divides these input data to be three part. It will bedescibed visually on Figure 3.

Key	Command
1,2,3,4,5, 6,7,8,9,0	Fill the phone number
#	input phone number to the system
*	send sms and change the turn of queue

Figure 3. Keypad Input Data

By seeing the Figure 2 above, we can further take a look to the flowchart of subroutine send_sms and input_number which are shown in the Main System Flowchart.

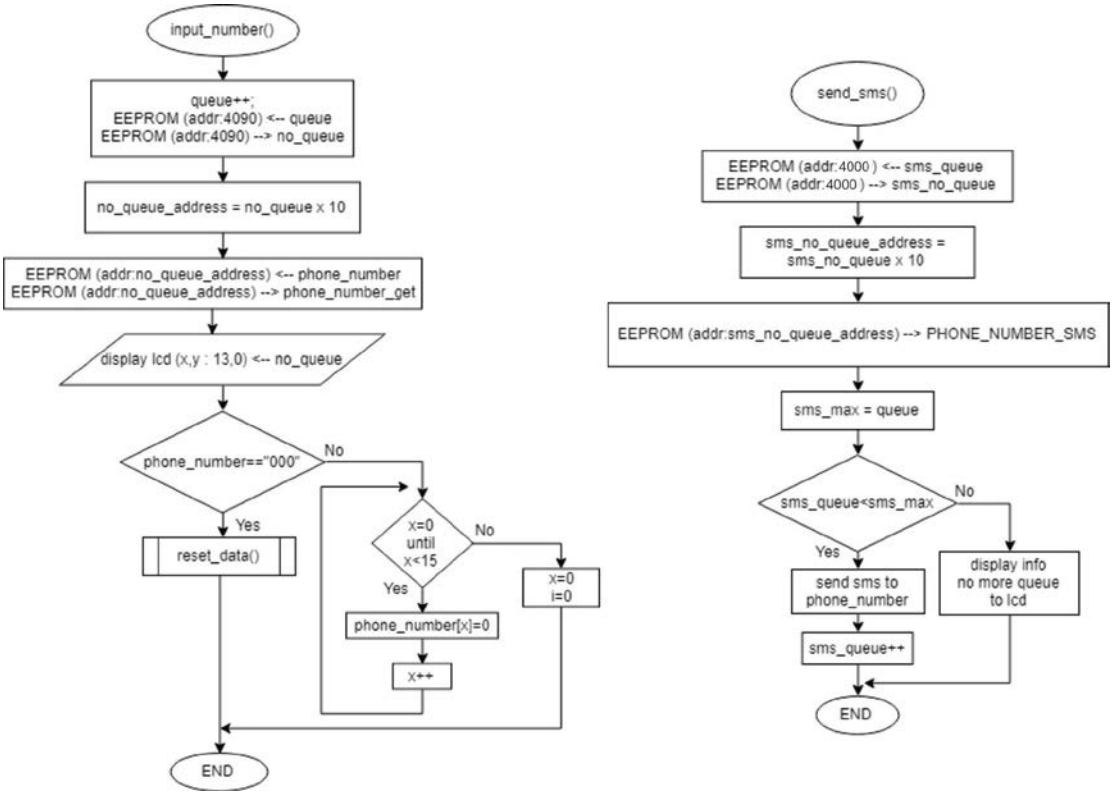

Figure 4. send_sms and input_number Flowchart

In Figure 4 is shown that the mechanism of sending SMS and inputing phone number are independent algorithms. But there is a relation, EEPROM data is being shared for the both subroutine. So, when we want to send SMS reminder to the patient, the phone number is gotten from the EEPROM data. Phone numbers are stored by subroutine input_number to EEPROM memory. And the memory allocation of the EEPROM will be shown in Table 1.

Table 1. EEPROM Memory Allocation

Address	Allocation
0-3500	Phone numbers
4090	Queue user number
4000	Queue reminder number

Since Arduino Mega 2560 has 4096 bytes, it means we have 4096 room to store data. Address 0 until 4095 is available to save all data that we need in this project. But for this project, we only use some of those. Because, a phone number has more than 10-digits number. And an address of EEPROM, cannot handle that. In this case, we use

addresses from address 0, address 10, address 20, and countinue with increment 10 until address 3500. For saving the queue number of a user, we use address 4090. This queue user number is used to let the user know what number they are in the waiting line. And the third allocation is for saving the reminder sequencial number. This third allocation will call in subroutine send_sms. When subroutine send_sms call, it will remind the user that his or her turn is about to come, and the data inside this allocation will be added by one, so the sequencial turn will happen. All data that are stored in EEPROM is integer number.

There is one more algorithm left, subrouitnereset_data. This routine is used to erase all the data inside the EEPROM. By applying this subroutine, the operator of this device does not need to worry about reseting the data in the next day.

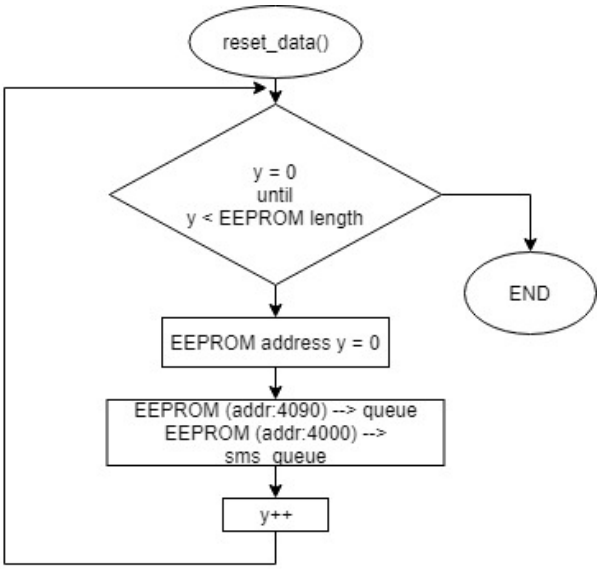

Figure 5. reset_dataFlowchart

To reset the whole data of the EEPROM, the operator need to input ‘000’ on the device. By sending this ‘000’ value, the whole data will be erased. The algorithm in Figure 5 explains that doing looping function is erasing every address’s data.

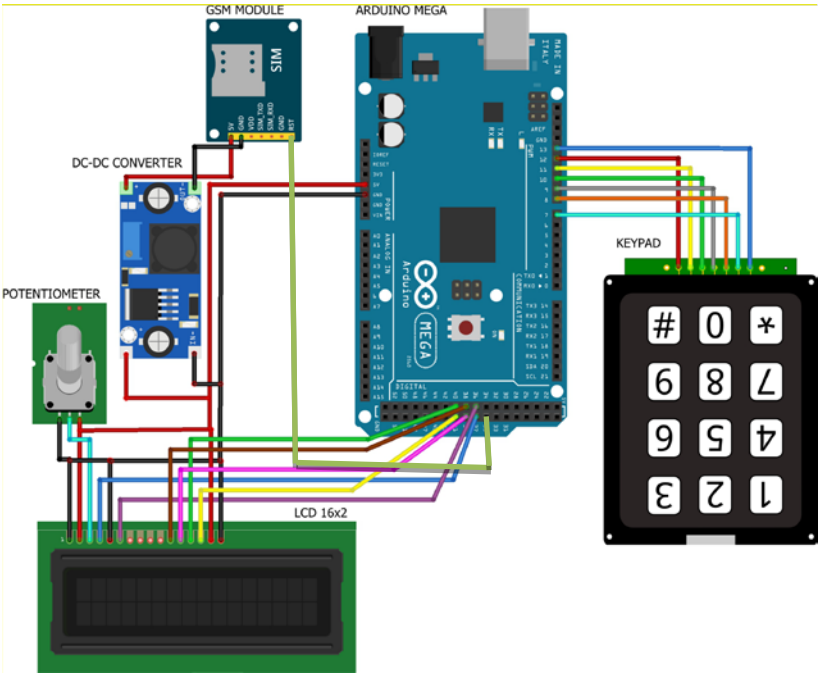

Figure 6. Circuit of the device

According toFigur6, Arduino Mega 2560, DC-DC voltage converter, Keypad, SIM800L module, LCD display and potentiometer are the components that we use in this Q-Minder device. As a brain of the device, Arduino will accommodate the whole algorithms inside the device. Here is each components brief explanation of the device:

a. Arduino Mega 2560 :We use this type of Arduino, because it has more EEPROM memory than Arduino UNO. As we mentioned earlier, Arduino Mega 2560 has 4096 bytes of EEPROM memory. It will make us easer to allocate the memory usage. b. Keypad 3x4 :The type of keypad that we use is membrane matrix 3x4 keypad. It has 12 buttons, and made from membrane, so it is very thin. We use this keypad, because its flexibility and low-cost.c. SIM800L: SIM800L is one of a GSM/GPRS module that uses TTL Serial Communication. It needs 3.7 DC Volts to work properly. d. DC-DC converter: Since the SIM800L works on 3.7 DC Volts, we need a component that can step-down the 5 Volts from Arduino. We use LM2596 to handle this job. LM2596 is a voltage regulator that can handle input voltage from 3 until 40 DC Volts. e. LCD:To display the interaction between system and user, we need an interface. Alphanumeric LCD 16x2 with 4/8bit connection is one of the solution for it that we can afford. f. Potentiometer:To adjust the backlight

of the LCD we need a potentiometer. The potentiometer that we use in this project is 5K Ohms.

3. RESULT AND DISCUSSION

Since this device has four mainactivities in this Q-Minder device, the first activity is inputing user's phone number to the device.The second is saving phone number to the device's memory. The third function is the process of getting the queue number after a user puts his phone number. And the fourth is sending a reminder to a user via SMS, that is controlled by an operator.

Table 2. The Features of Q-Minder

No	Activity
1	Phone number input
2	Saving phone number to memory
3	Getting queue number
4	Sending SMS Reminder

3.2User Interface (UI)

Here is some figures to explain how the user interface looks like:

a) Before a user inputs a phone number:

Figure 7. UI 1

b) A user type a phone number:

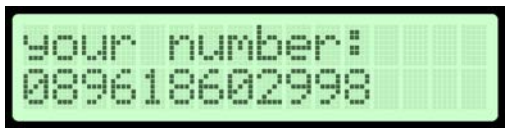

Figure 8. UI 2

c) A user inputs phone number to the memory:

Figure 9. UI 3

d) Anoperator sends SMS reminder to a user:

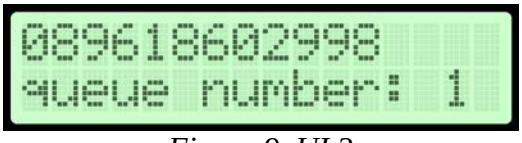

Figure 9. UI 3

e) **User receive SMS warning:**

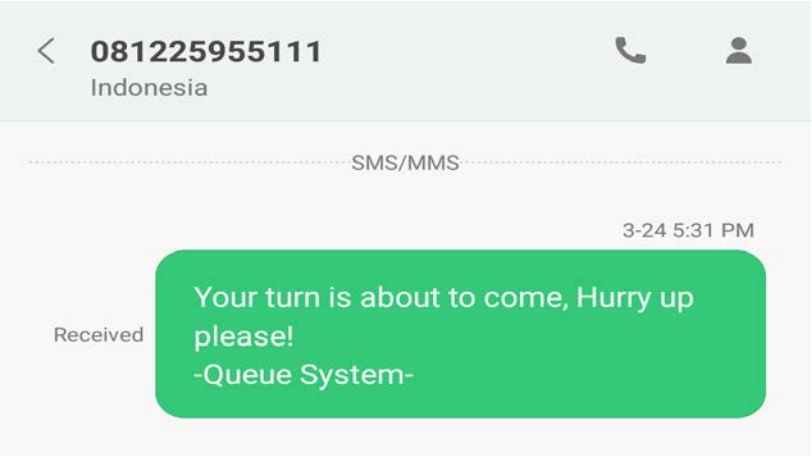

Figure 10. UI 1

3.2Experiment: Testing The Device

In this experiment, we conducted a test to send SMS's to several phone number that have been put into the memory of Q-Minder device, and monitor the success rate of the sending process. In This experiment, we will send SMS reminder to ten different phone numbers.

Table 3. Experiment 1

No	Phone Number	Success
1	087821088310	Yes
2	085266710176	Yes
3	082279496322	Yes
4		

From Table 3, we can see that we succeeded sending SMS reminder to ten different phone numbers. It means, from the experiment we got 100% success rate of sending SMS reminder using Q-Minder device.

3.3 Analysis

On the Q-Minder device, we have a GSM Module component that plays the role of sending the SMS to users. The conducted experiment above shows that the whole components perform well as a unity. But there are some limitations of this project:

a) When there is no pulse credit on the SIM card, the process of sending SMS will be off. b) When the signal of SIM provider is weak, the possibility of getting more delays on SMS sending is higher.

4. CONCLUSION

After conducting some activity for finishing this final project, which is making Q-Minder device, we can conclude that this device is able to solve the queue problem in hospital. Not only in hospital, this device, basically can handle the queue problem in

other place too. The feature of sending SMS is a differentiation to other devices that exist on the market.

From the experiment that was already conducted, we can conclude that, as long as the signal is good and there is enough amount of pulsa, the Q-Minder can perform well. Even reaching 100% of success rate of sending SMS reminder.

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